



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/717,919	11/21/2003	Ki-hyun Kim	1793.1078	7566
49455 7590 10/11/2007 STEIN, MCEWEN & BUI, LLP 1400 EYE STREET, NW SUITE 300 WASHINGTON, DC 20005			EXAMINER TORRES, JOSEPH D	
			ART UNIT 2112	PAPER NUMBER
			MAIL DATE 10/11/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/717,919	KIM ET AL.	
	Examiner	Art Unit	
	Joseph D. Torres	2112	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 19 July 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) 1-6, 13-27, 34-43 and 45 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-12, 28-33 and 44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2007 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/08/2005</u>  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of Group II, claims 7-12, 28-33 and 44 in the reply filed on 07/19/2007 is acknowledged. The traversal is on the ground(s) that Group III is statutory. This is not found persuasive because claims 13-21 recite an apparatus comprising a transmission channel. Paragraph [0003] in the Applicant's specification teaches that a spatial medium is a transmission channel. Spatial media is natural phenomena and does not fall into one of the statutory categories of invention.

The requirement is still deemed proper and is therefore made FINAL.

Claims 1-6, 13-27, 34-43 and 45 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected inventions, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 07/19/2007.

### ***Drawings***

2. The drawings are objected to because de-interleaver 233 and de-interleaver 333 are incorrectly labeled in the drawings. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as

"amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

3. The disclosure is objected to because of the following informalities:

The specification recites, "performing a first soft encoding to correct errors in input data". Nowhere does the Applicant teach and enable performing a first soft encoding to correct errors in input data. The Applicant instead teaches and enables performing a first soft encoding intended for use in a decoding device to correct errors to recover originally first encoded input data.

The specification recites, "performing a second soft encoding to determine a success or failure of the encoding of the first soft-encoded data". Nowhere does the Applicant teach and enable performing a second soft encoding to determine a success or failure of the encoding of the first soft-encoded data. The Applicant instead teaches and

enables performing a second soft encoding intended for use in a decoding device to determine a success or failure during decoding of the first soft-decoded data.

The term "soft encoding" in the specification appears to be used in the specification to mean "an encoding with intended use in a soft decoding device", while the accepted meaning is "encoding to produce soft values."

term "soft encoder" in the specification appears to be used in the specification to mean "an encoder with intended use in a soft decoding device", while the accepted meaning is "encoder that produces soft values."

The term "soft-encoded data" in the specification to mean "encoded data with intended use in a soft decoding device", while the accepted meaning is "soft value encoded data."

The specification recites, "puts a soft output of the second soft decoder in a space of non-decoded data" and "keeps a space of non-decoded data of the second soft-decoded data empty", which does not make sense because there is no connection between space and non-decoded data. That is it is not clear what a "space" has to do with non-decoded data.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 2112

4. Claims 11, 12, 32 and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 11, 12, 32 and 33 recite, "puts a soft output of the second soft decoder in a space of non-decoded data" and "keeps a space of non-decoded data of the second soft-decoded data empty", which does not make sense because there is no connection between space and non-decoded data. That is it is not clear what a "space" has to do with non-decoded data.

Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. Claim 11 recites. "puts a soft output of the second soft decoder in a space of non-decoded data". The Examiner asserts "a space of non-decoded data" is not a structural element and hence has no structural relationship or connection to other structural elements in claims 7 and 11.

Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. Claim 12 recites. "keeps a space of non-decoded data of the second soft-decoded data empty". The Examiner asserts "a space of non-decoded data" is not a

Art Unit: 2112

structural element and hence has no structural relationship or connection to other structural elements in claims 7 and 12.

***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claim 44 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 44 recites a "computer readable medium". Paragraph [0042] in the Applicant's specification teaches that a carrier wave is "computer readable medium". Carrier waves do not fall into one of the statutory categories of invention.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

Art Unit: 2112

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 7-10, 28-31 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Figure 1 and Background of the Invention in Burd et al. (US 6965652 B1, hereafter referred to as Burd) in view of Zhang; Vicki Ping et al. (US 6233709 B1, hereafter referred to as Zhang).

35 U.S.C. 103(a) rejection of claims 7, 28 and 44.

Burd teaches a first soft decoder performing a first soft decoding of input data to correct errors in the input data and outputting first soft-decoded data (Soft Channel Decoder 504 in Burd); and a second soft decoder receiving the first soft-decoded data, performing a second soft decoding of the first soft-decoded data, and outputting second soft-decoded data (Soft linear Block Code Decoder 506 in Burd). Note: Burd teaches an iterative decoder (in Figure 1 of Burd), but does not teach the stop criteria for the decoder.

However Burd does not explicitly teach the specific use of additional information indicating a success or failure of the decoding of the first soft-decoded data.

Zhang, in an analogous art, teaches use of additional CRC information indicating a success or failure of the decoding of the first soft-decoded data (Decision Circuitry 118 in Figures 1 and step 208 in Figure 2 in Zhang teaches stop criteria using additional CRC information indicating a success or failure when decoded, provided from the final output of the second decoder 112 in Figure 1 of Zhang).



Art Unit: 2112

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Burd with the teachings of Zhang by including use of additional information indicating a success or failure of the decoding of the first soft-decoded data. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of additional information indicating a success or failure of the decoding of the first soft-decoded data would have provided a stop criteria for an iterative decoder such as iterative Decoder 500 in Burd.

35 U.S.C. 103(a) rejection of claims 8 and 29.

Figure 1 of Zhang.

35 U.S.C. 103(a) rejection of claims 9 and 30.

Soft linear Block Code Decoder 506 in Burd is for LDPC code.

35 U.S.C. 103(a) rejection of claims 10 and 31.

Decision Circuitry 118 in Figures 1 and step 208 in Figure 2 in Zhang.

7. Claims 11 and 32 rejected under 35 U.S.C. 103(a) as being unpatentable over Figure 1 and Background of the Invention in Burd et al. (US 6965652 B1, hereafter referred to as Burd) in view of Zhang; Vicki Ping et al. (US 6233709 B1, hereafter referred to as Zhang) in Further view of Song et al. (Hongxin Song, Richard M. Todd,

and J. R. Cruz, Low Density Parity Check Codes for Magnetic Recording Channels, IEEE TRANSACTIONS ON MAGNETICS, VOL. 36, NO. 5, SEPTEMBER 2000) [hereafter referred to as Song].

35 U.S.C. 103(a) rejection of claims 11 and 32.

Burd and Zhang substantially teaches the claimed invention described in claims 7-10 (as rejected above). Note: Burd does not teach elements of the channel encoder corresponding the Soft Channel decoder 504, but assumes one of ordinary skill in the art at the time the invention was made would understand the operation of channel encoders. Figure 1 on page 2184 of Song is a teaching reference for channel encoding and in particular LDPC Encoder followed by a  $1/(1+D)$  partial response channel encoder. Note: LDPC code is interleaved prior to partial response channel encoding. In addition, Interleavers 512 and 514 in Burd comprise an interleaver which, according to the additional information, performs a hard-decision for successfully decoded data to restore original data (Decision Circuitry 118 is part of the second interleaver 114 in Zhang corresponding to interleaver 514 in Burd for performing hard-decision for successfully decoded data), puts a soft output of the second soft decoder in a space of non-decoded data (unsuccessful data is put back into a space of interleaver 110 corresponding to interleaver 512 in Burd), performs interleaving, and feeds back the interleaved data to the first soft decoder, wherein the first soft decoder performs repeated decoding (interleaver 512 in Burd feeds back the interleaved data to the first soft decoder 504 in Burd).

However Burd and Zhang do not explicitly teach the specific use of a de-interleaver de-interleaving the first soft-decoded data corresponding to an interleaving order used upon encoding; and an interleaver which, according to the additional information, performs a hard-decision for successfully decoded data to restore original data, puts a soft output of the second soft decoder in a space of non-decoded data, performs interleaving, and feeds back the interleaved data to the first soft decoder, wherein the first soft decoder performs repeated decoding.

Song, in an analogous art, teaches use of a de-interleaver de-interleaving the first soft-decoded data corresponding to an interleaving order used upon encoding (De-interleaver 2 in Figure 1 on page 2184 of Song).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Burd and Zhang with the teachings of Song by including use of a de-interleaver de-interleaving the first soft-decoded data corresponding to an interleaving order used upon encoding. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of a de-interleaver de-interleaving the first soft-decoded data corresponding to an interleaving order used upon encoding would have provided de-interleaving for channel interleaved data (Figure 1 on page 2184 of Song).

8. Claims 12 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Figure 1 and Background of the Invention in Burd et al. (US 6965652 B1, hereafter

Art Unit: 2112

referred to as Burd) in view of Zhang; Vicki Ping et al. (US 6233709 B1, hereafter referred to as Zhang) in Further view of Song et al. (Hongxin Song, Richard M. Todd, and J. R. Cruz, Low Density Parity Check Codes for Magnetic Recording Channels, IEEE TRANSACTIONS ON MAGNETICS, VOL. 36, NO. 5, SEPTEMBER 2000) [hereafter referred to as Song] in further view of (Yu; Xiaoyong et al. (US 6307901 B1, hereafter referred to as Yu).

35 U.S.C. 103(a) rejection of claims 12 and 33.

Burd, Zhang and Song substantially teaches the claimed invention described in claims 7-11 (as rejected above). In addition, Burd, Zhang and Song a de-interleaver de-interleaving the first soft-decoded data corresponding to an interleaving order used upon encoding (De-interleaver 2 in Figure 1 on page 2184 of Song). In addition, Interleavers 512 and 514 in Burd comprise an interleaver which, according to the additional information, performs a hard-decision for successfully decoded data of the second soft-decoded data to restore original data (Decision Circuitry 118 is part of the second interleaver 114 in Zhang corresponding to interleaver 514 in Burd for performing hard-decision for successfully decoded data), keeps a space of non-decoded data of the second soft-decoded data empty (Note: data that is successfully decoded is not sent back to Interleaver 512 in Burd), performs interleaving, and outputs the interleaved data (Interleaver 514 in Burd), wherein the first soft decoder performs repeated decoding (Figure 1 in Burd is an iterative decoder).

Art Unit: 2112

However Burd, Zhang and Song do not explicitly teach the specific use of a data insertion unit inserting an output of the first soft decoder in the empty space of the interleaved data output from the interleaver and feeding back resulting data indicative thereof to the first soft decoder.

Yu, in an analogous art, teaches a data insertion unit inserting an output of the first soft decoder in the empty space of the interleaved data output from the interleaver and feeding back resulting data indicative thereof to the first soft decoder (Puncturing and MUX unit in Figure 5 of Yu).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Burd, Zhang and Song with the teachings of Yu by including a data insertion unit inserting an output of the first soft decoder in the empty space of the interleaved data output from the interleaver and feeding back resulting data indicative thereof to the first soft decoder. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that a data insertion unit inserting an output of the first soft decoder in the empty space of the interleaved data output from the interleaver and feeding back resulting data indicative thereof to the first soft decoder would have provided reuse of the past, the present and the future information calculated for the information bits for the coded bits. (col. 5, lines 30-34 in Yu).

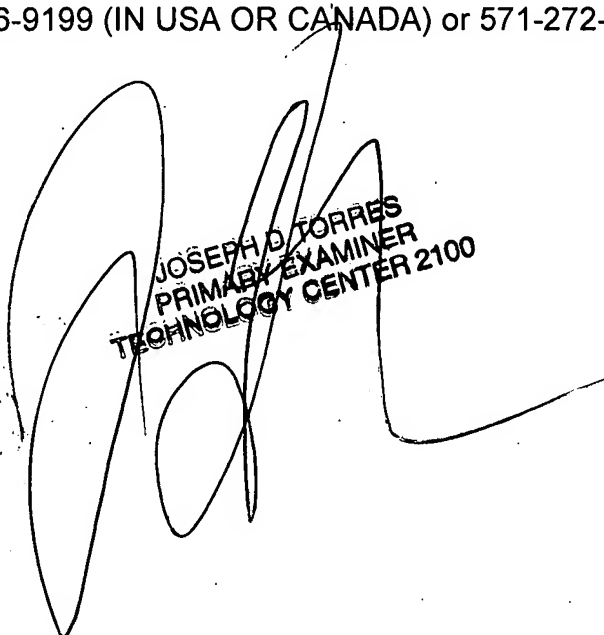
***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jing et al. (Jing Li, Krishna R. Narayanan, Erozan Kurtas, and Costas N. Georghiades, On the Performance of High-Rate TPC/SPC Codes and LDPC Codes Over Partial Response Channels, IEEE TRANSACTIONS ON COMMUNICATIONS, VOL. 50, NO. 5, MAY 2002).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (571) 272-3829. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jacques Louis-Jacques can be reached on (571) 272-6962. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A large, stylized handwritten signature in black ink, appearing to read 'J. D. Torres', is written over a rectangular stamp.

JOSEPH D. TORRES  
PRIMARY EXAMINER  
TECHNOLOGY CENTER 2100

Joseph D. Torres, PhD  
Primary Examiner  
Art Unit 2112